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记原始恐头兽类一新属种

—— 甘肃玉门晚二叠世脊椎动物群系列报道之三[1)]

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摘要 记述了恐头兽类一新属种利齿狭头兽(*Stenocybus acidentatus* gen. et sp. nov.)。它以高而窄的头骨，轻巧的结构，大的眼孔，小的颞孔，三角形的上颌骨有别于所有已知的恐头兽类。它的门齿结构，及出现在头骨顶面容纳下颌收肌的凹陷显示了与安泰龙科(Anteosauridae)之间的密切关系。但其狭窄的头骨，大而侧扁的犬齿，及较为长大、侧扁、具边缘锯齿的犬齿后齿表明它代表一个新科，而且是恐头兽类中最为原始的科。

关键词 甘肃 玉门，晚二叠世，恐头兽亚目，狭头兽科

中图法分类号 Q915.864

玉门大山口动物群发现于上二叠统西大沟组一个单一的化石点。化石含量丰富。有关化石点发现的意义，它的地层划分及岩性，动物群的组成情况及部分种属的鉴定已有数篇文章先期论述(程政武等，1996; 李锦玲等，1995; Li and Cheng, 1995)。本文是继程政武和姬书安(1996)对动物群中一肉食性恐头兽类中国猎兽(*Sinophoneus*)报道之后，对与其共生的，在结构上更为原始的一恐头兽类所作的简单描述。

恐头兽亚目 Dinocephalia Seeley 1894
狭头兽科(新科) Stenocybusidae fam. nov.

特征 小型(长头 12 — 15 厘米)，头骨高而窄，结构轻巧，无任何肿胀和加厚现象；眼孔大，侧颞孔小；上颌骨呈高的三角形，其顶点位于犬齿上方，与前额骨相接；无额骨结节和额骨上的眶间嵴；头骨顶面容纳下颌收肌的凹陷前缘位于后额骨上；翼骨横突和腭骨具齿；边缘齿式为 I5 /4 C1 /1 PC6 –8 /6; 门齿长，强烈前伸，且上下交叉，具明显的舌面齿踵结构。

讨论 该科动物的具齿踵结构且上下交叉的门齿，及出现在头骨顶面顶孔两侧容纳下颌收肌的凹陷，与恐头兽类安泰兽科(Anteosauridae)相似，但它的轻巧的头骨结构，

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大的眼孔，小的侧颞孔有别于安泰兽科的所有成员。它的三角形的上颌骨及前伸的泪骨，是兽孔类中所独有的，与进步的盘龙类 sphenacodontids 相似(Laurin and Reisz, 1996)。该科的自近裔性状为极狭窄的头骨，大而侧扁的犬齿，及数目较少、较为长大而侧扁、具边缘锯齿的犬齿后齿。

狭头兽(新属) *Stenocybus* gen. nov.

利齿狭头兽(新种) *S. acidentatus* gen. et sp. nov.

(图1；图版I，II)

词源 希腊语 steno－ 狭窄，cyb－ 头，acidentatus 利齿的。

特征 见科的特征。

正模 一后部稍有破损的头骨和完整的下颌(中国地质科学院地质研究所，V 361)。

副模 一带有完整齿列的左前颌骨，左上颌骨和左齿骨(古脊椎动物与古人类研究所，V 12008)。

地点和层位 甘肃玉门大山口，上二叠统西大沟组。

标本记述 头骨高而窄，顶视呈一狭长的三角形。结构轻巧，没有骨片的肿胀和加厚现象。眶前部短，小于头骨长度的二分之一。前颌骨背突分割开左右外鼻孔，前颌骨主体部的后端伸入到上颌骨的内侧，二者间有部分重叠，这样侧视面上最后一个前颌骨齿好象由上颌骨的前端伸出。前颌骨齿缘自后向前上扬。上颌骨为高的三角形，它不同于其它的恐头兽类(Laurin and Reisz, 1996)，上颌骨的顶端位于骨片的前半部犬齿上方，与前额骨相接。上颌骨骨片极薄，副模内侧可观察到一大的瘤状骨质结节，犬齿齿根自下方伸入其间。这一结构明显地加大了上颌骨的强度，是对其肉食习性的一种适应。上颌骨腹缘犬齿之前和犬齿之后具明显的齿隙(diastema)。上颌骨与俄罗斯下卡赞阶的 *Microsyodon orlovi* (Ивахненко, 1995)的上颌骨在形态和大小上极为相似，但后者犬齿之前有一小的上颌骨齿，犬齿后的颊齿数目较多(10枚)。细长条状的隔颌骨在正模与副模上都没有贴靠在上颌骨的前缘，而是位于大的外鼻孔内，将其分割成前后两部分，它的后背端插入鼻骨与上颌骨间。

鼻骨后端在眼孔前缘一线插入到额骨间，它与周围其它骨片的界限不甚清晰。它的前突伸达何处虽然无法最终确定，但鼻骨显然形成了外鼻孔的后背缘。额骨为眼孔上缘的组成部分。中线部位不具眶间嵴。后额骨稍向外侧扩张，在其顶面后部有一弧形的嵴，标志着下颌收肌固着处的前缘。顶骨小，左侧破损，右侧可见围绕顶孔高高的骨质结节，位于头骨顶面的后缘。

颧骨大，颧弓较为平直，内外侧扁。眶后骨下突与颧骨上突一道隔开了卵圆形的眼孔和近于三角形的侧颞孔。眼孔大，约为侧颞孔的两倍。左鳞骨与眶后骨一道被挤压错位。它的下半部沿着与棒骨的缝合线向后移动，呈一纵嵴突出在枕面之后。它的下端位于上颌齿列一线。左方颧骨保存完好，为一上宽下窄小型的竖直骨片。它的位置极低，下端伸入下颌关节窝内。左右方骨都破损得难于辨识。

由于挤压变形，也由于骨缝不明显，对枕面的描述几乎无法准确地进行。从保存部分估量，自然状态下的枕面与头骨的整体形态一致，相当高而窄，面向后上方。枕髁大，

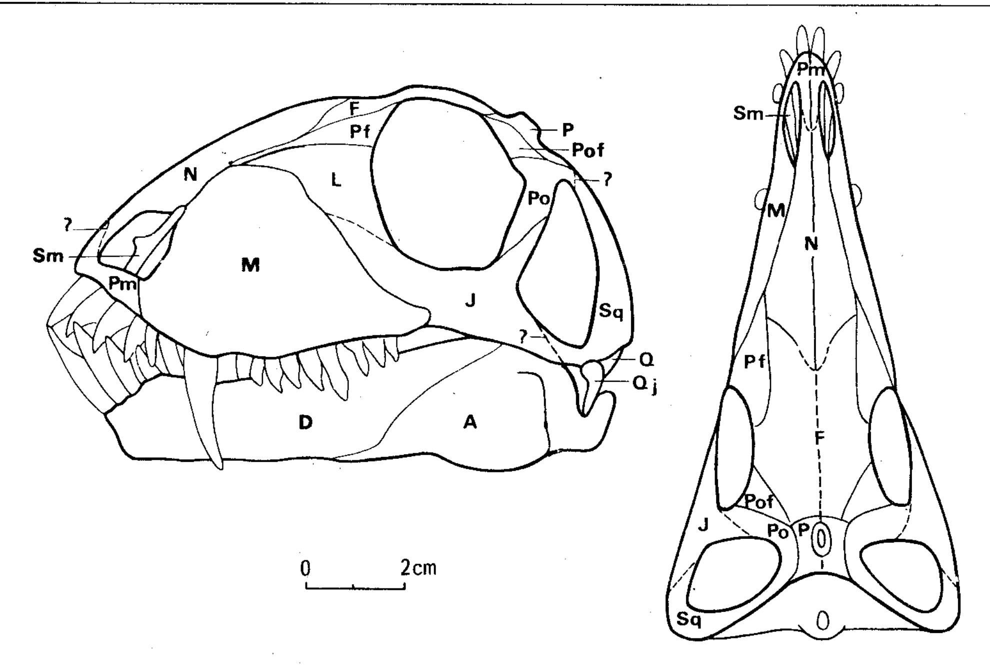


图 1　利齿狭头兽(新属新种)头骨(侧视、顶视)结构复原图(IGCAGS V 361)

Fig.1 Reconstruction of skull of *Stenocybus acidentatus* gen. et sp. nov. in lateral and dorsal view

Abrreviation: A. 隅骨 angular; D. 齿骨 dentary; F. 额骨 frontal; J. 颧骨 jugal; L. 泪骨 lacrimal; M. 上颌骨 maxilla; N. 鼻骨 nasal; P. 顶骨 parietal; Pf. 前额骨 prefrontal; Pm. 前颌骨 premaxilla; Po. 眶后骨 postorbital; Pof. 后额骨 postfrontal; Q. 方骨 quadrate; Qj. 方颧骨 quadratojugal; Sm. 隔颌骨 septomaxilla; Sq. 鳞骨 Squamosal

位于头骨的最后端，微弱三分，由基枕骨和外枕骨组成。枕骨大孔两侧可见两块厚大的骨板，它当包括上枕骨、间顶骨和部分棒骨。

头骨腭面后部破损严重，前部又被咬合在一起的下颌所盖，许多特征没有显露出来。基蝶骨大部分保存，但它与周围骨片脱离开。基蝶骨后部中央为一深凹，前部则具一中嵴，嵴的两侧可见小的颈动脉孔。翼骨的腭支缺失，翼骨横突和方骨支保存。横突上着生一排 6— 7 枚小齿。腭骨结节上有 4— 5 个粗大的腭骨齿。

下颌齿骨窄长，其上缘在犬齿之前向下倾伏，与上颌骨前部及前颌骨的下缘向上翘起相对应。下颌喙状突明显，齿骨的后端伸达喙状突之后，内侧可见大的夹板骨。隅骨后部的反射片(reflected lamina)发育。下颌关节并未前移，位于头骨的最后端，且低于下颌齿列。

齿系：前颌齿 5 枚，与之相对应的下颌门齿 4 枚。齿冠长，强烈地向前下方或前上方伸出。齿冠的唇面为弯曲的弧形，舌面具明显发育的齿踵(heel)结构。第一齿最大，向后逐渐变小变细。上下门齿互相交叉。犬齿一枚，极为长大，上颌犬齿可伸达下颌边缘。齿冠侧扁，弯曲向后，具明显的前后棱边缘锯齿结构。上颌颊齿 6— 8 枚，由前向后呈现由小到大，再到小的波曲。下颌颊齿 6— 7 枚，大小较为均一。齿冠为矛尖

状，齿尖弯曲向后，内外侧扁，唇面微凸，舌面较平，具前后棱及棱上的锯齿。

表1 (Table 1) 单位：厘米(cm)

头长(吻端－下颌关节部) skull length	12.0— 12.5
眶前部长 length of preorbital region	5.0— 5.5
眶前部高(眼孔前缘一线) height of preorbital region	4.5
眶间部宽 width of interorbital region	3.5
左眼孔大小(长 × 宽) size of left orbit (length ×width)	3.0×4.0
右眼孔大小(长 × 宽) size of right orbit (length ×width)	3.0×4.5
下颌长 length of lower jaw	10.5
下颌最大高度 maximum height of lower jaw	3.0

比较与讨论 Hopson 等(1986)将兽孔类分为原始的和进步的两部分。前者包括 Biarmosuchia 和 Eotitanosuchia，后者包括恐头兽类、异齿兽类(anomodonts)和兽齿类(theriodonts)。玉门材料的头骨结构轻巧，侧颞孔较小，与原始的兽孔类相似，而与同时代恐头兽类硕大的体型、粗壮的头骨形成鲜明的对照。但由于它具有互相交叉的上下门齿，门齿的舌面具齿踵结构，及头骨顶面顶孔的两侧用以固结下颌收肌的凹陷，表明它是恐头兽类的一个成员。

原始的恐头兽类都包括在 Anteosauridae中，按照 King (1988) 的定义，它们是一类门齿上具齿踵结构，头骨有加厚(pachyostosis)倾向，和颌关节稍前移的动物。在门齿结构上，狭头兽与定义的第一点一致，而且齿踵结构及上下门齿交叉的清晰程度超过了该科的任何一个属。可是狭头兽不具头骨加厚和颌关节前移的倾向。据 Hopson and Barghusen (1986)，Anteosauridae (=Anteodaurian) 成员具上翘的前上颌骨齿缘和鳞茎状(bulbous)的犬齿后齿。狭头兽与定义的第一点一致，但它的犬齿后齿较为长大、侧扁，且具边缘锯齿。分析表明狭头兽代表恐头兽类中一原始的新科，它的原始性表现在下列几个方面：(1)头骨小，结构轻巧。这既不同于 Anteosauridae 中大型的、额骨－鼻骨－前额骨区肿胀、具颧骨和隅骨节瘤的 *Anteosaurus* (见 Boonstra, 1954)，也不同于一些中等大小、头骨顶面骨片略有加厚的、较原始的代表，如 *Syodon* (见 Чудинов, 1983)、*Australosyodon* (见 Rubidge, 1994) 等。(2)下颌关节位于头骨的最后端，未向前移动。(3)眼孔大，侧颞孔小。玉门材料的头骨高而窄，顶面在额骨之后倾向后下方，使眶后部的高度降低。它的侧颞孔三角形，只为眼孔大小的二分之一。颞孔的背缘低于眼眶的背缘，这与进步的盘龙类 Sphenacodontidae 的 *Haptodus*, *Dimetrodon* 及原始的恐头类 *Biarmosuchus* (见 Чудинов, 1983; Sigogneau and Tchdinov, 1972) 的情况十分相似。Anteosauridae 的其它成员如 *Syodon*, *Australosyodon* 和 *Titanophoneus* (见 Орлов, 1958) 都具有在背腹向扩展的侧颞孔。(4)上颌骨为三角形，且三角形的顶点位于它中线的前侧。泪骨虽未伸达外鼻孔，但它向前延伸的程度超过了 Anteodauridae 中所有的属。(5)下颌收肌的外侧支可伸达后额骨的顶面。这比可伸达额骨顶面的 *Australosyodon* 要原始，但比下颌收肌不出现在顶面的原始兽孔类 *Biarmosuchus*，和仅出现在眶后骨侧面的 *Eotitanosuchus* 要进步。换言之，所有其它的恐头兽类在上述 5 个特征上都比狭头

兽类进步。在这个意义上狭头兽科可以被看作是所有其它恐头兽类的姐妹群。狭头兽科的支序分类位置如图 2 所示。

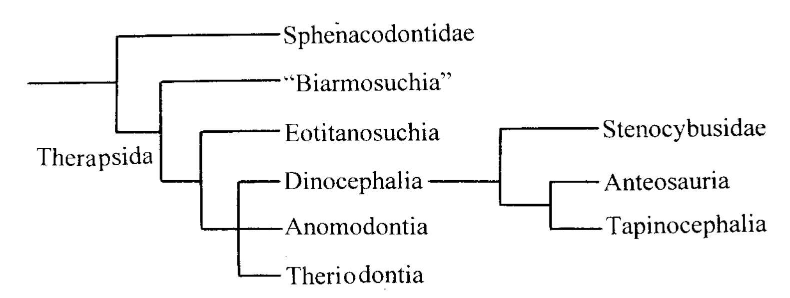


图 2　表示狭头兽科(新科)与兽孔类主要类群间关系的分支图
(据 Hopson 和 Barghusen，1986　图 1.4)

Fig.2　A cladogram depicting interrelationship of the Stenocybusidae Fam. nov. with major groups of the Therapdida (Based on Hopson and Barghusen, 1986 Figs. 1, 4)

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A NEW GENUS OF PRIMITIVE DINOCEPHALIAN —— THE THIRD REPORT ON LATE PERMIAN DASHANKOU LOWER TETRAPOD FAUNA

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Key words Yumen, Gansu, Late Permian, Stenocybusidae, Dinocephalia

Summary

Material of the Late Permian Dashankou fauna was collected from a quarry at Yumen, Gansu, Northwest China. Significance and composition of the fauna, stratigraphical and lithological characters of the fossil-bearing beds have been previously demonstrated in the several papers (Cheng *et al.*, 1996; Li and Cheng, 1995; Cheng and Ji 1996). Based on some excellent preserved specimens, the second genus of Dinocephalia in the fauna, following the first one, *Sinophoneus* Cheng and Ji, 1996, is described in the present paper.

Dinocephalia Seeley 1894

Stenocybusidae fam. nov.

Diagnosis Small-sized dinocephalian (skull length 12— 15 cm). Skull high, narrow and slender without pachyostosis; orbit large and temporal fossa small; maxilla high and triangular-shaped, its top locating above canine and connecting with prefrontal; lachrymal large and extending forward; frontal with no boss and interorbital ridge; the anterior border of depression receiving lower jaw adductor located on the dorsal surface of postfrontal; small teeth present on palatine and transverse process of pterygoid; marginal teeth formula I5 /4 C1 /1 PC6-8 /6; incisor of large length with labial talon pointer and lingual heel, they procumbent and interlocked.

Discussion In having interlocked incisors with lingual heel and depression receiving lower jaw adductor on the dorsal surface of skull, *Stenocybus*, the only genus of

Stenocybusidae is similar with genera of Anteosauridae, but distinct to them in light-structured skull, large orbit and small temporal fenestra. The triangular maxilla and anteriorly streched lacrimal of *Stenocybus* resemble that of pelycosaurid sphenacodontid, but are unique in therapsids (Laurin and Reisz, 1996). Autapomorphic characters of new family are the very narrow skull, large and compressed canine, and relatively large, compressed postcanine with serretions on fore and aft carenea.

Stenocybus acidentatus gen. et sp. nov.

Etymology Greek *Steno*-narrow, *cyb*-skull; *acidentatus* sharp-pointed teeth.

Type A slightly damaged skull associated with almost complete lower jaws (IGCAGS V 361).

Paratype A right premaxilla, maxilla and dentary with complete upper and lower dentitions (IVPP V12008).

Locality and horizon Dashankou, Yumen, Gansu province. Xidagou Formation, Upper Permian

Diagnosis As for the family.

Description The skull is smaller and slenderer than that of all the other dinocephalian. It is high and narrow, bearing no bone thickening or pachyostosis. The preorbital region, shorter than half of the skull length, is very narrow from side to side. For the damage, the end position of dorsal process of premaxilla, which separate the two narials is uncertain. The main body of premaxilla extends posteriorly and stretches to the level medial to the anterior end of maxilla. Therefore, on the lateral view, the last premaxilla tooth looks like protruding from maxilla. The top of triangular-shaped maxilla is located directly above the canine and contacts prefrontal. The maxilla, being a very thin bone is strengthened by a large bony tubercle protruding on its inner surface. The root of canine stretches into the tubercle. There are distinct diastemas before and behind the canine. The maxilla is similar to that of *Microsyodon orlovi* in size and shape (Ивахненко, 1995), but the latter has more post canine teeth and a small tooth before canine. The lacrimal extends forward primitively. The septomaxilla instead of being close to the anterior border of maxilla, lies in the narial and divides the latter into two parts. Its post-dorsal end inserts between the nasal and maxilla.

The nasal extends postwards to the level of the anterior border of orbit between frontals. It definitely forms the post-dorsal margin of narial, although the anterior end of nasal is uncertain. The frontal without interorbital ridge on dorsal surface, contributes to the margin of orbit. The postfrontal expands slightly laterally and bears an arch-shaped ridge on dorsal surface, indicating the anterior attachment of the lower

jaw adductor. The small parietal is damaged on left side, a high bony tubercle surrounding the pineal foramen can be observed near the posterior margin of the skull on right side.

The jugal is large and straight, compressed laterally. The lower process of postorbital joining with the upper process of jugal separates the oval orbit from the triangular temporal fenestra which is half of orbit in size. The left posterior part of skull is deformed. The squamosal and postorbital are placed internal to their original place and the lower part of squamosal moves backward along the suture with tabular and protrudes posteriorly as a longitudinal ridge on occipital surface. The left quadratojugal, a small vertical bone with upper end wider than lower one, is located rather low and reaches to the articular fossa of lower jaw. The quadrate on both sides can not be distinguished.

The bones of occipital plate are fused and damaged, many of their characters are rather obscure. In accord with the shape of skull, the occipital plate seems to be very high and narrow. The occipital condyle is large-sized and somewhat trifurcate-shaped consisting of basioccipital and lateroccipital. There are two rather large and thick bony plates at both sides of magnum occipital foramen which appears to be composed of the supraoccipital, interparietal and tabular, but the sutures between them are undetectable.

The posterior portion of palatal surface is seriously damaged and the anterior covered by occluding lower jaws. The basisphenoid has a central depression in posterior part, a mid-ridge in anterior part and carotid foramen on each side of the ridge. There is a row of 6—7 small teeth on pterygoid flange and a cluster of 4-5 stout teeth on palatine tubercle.

The dentary is narrow and long. Its upper margin before canine inclines downwards, corresponding to the tilted lower margin of premaxilla and maxilla. The posterior end of dentary is behind the coronoid process. A reflected lamina of angular is developed. The articulation of lower jaw is located at the posterior end of skull and lower than that of dentition.

Stenocybus has 5 upper and 4 lower incisors. Their crowns are very long and procumbent with curved labial talon apex and distinct lingual heel. They are interlocked and decreased in size backwards. The canine is of great length and laterally compressed with serrate fore and aft carinae. There are 6—8 cheek teeth on maxilla, arranging undulate in size small-large-small and 6 equal-sized teeth on dentary. They are spear-shaped, lateral compressed with slightly convex labial surface, flattened lingual surface and serrate fore and aft carinea too.

Comparison and discussion According to Hopson and Barghusen (1986), Therapsida can be divided into two groups, a primitive group including Biarmosuchia and

Eotitanosuchia and an advanced group including Dinocephalia, Anomodontia and Therocephalia. In having small and light-structured skull, small temporal fenestra, *Stenocybus* is more similar to primitive therapsids than to dinocephalians with massive skull and stout and large sized body. However, the features, such as the interlocked incisors bearing distinct lingual heel and the depression receiving lower jaw adductor presenting antero-lateral to the parietal foramen on the dorsal surface of the skull, indicate that *Stenocybus* is more closely related to Dinocephalian than to other therapsids.

Most primitive dinocephalians with incisors bearing lingual heel, tendency of skull pachyostosis anteriorly located lower jaw articulation, were included into Anteosauridae. Based on the characters described above, *Stenocybus* representing a new family, is more primitive than all other anteosaurids in following aspects:

1) *Stenocybus* with small and light-structured skull contrasts sharply to advanced, large-sized *Anteosaurus* with frontal-nasal-prefrontal region pachyostosis and also to relatively primitive, medial sized *Syodon* and *Australosyodon* with dorsal bones of skull slightly thickened.

2) The lower jaw articulation in *Stenocybus* has not been anteriorly moved as in other anteosaurids.

3) *Stenocybus* with large-sized orbit and small triangular-shaped temporal fenestra is different from other anteosaurids with dorsal ventral expanded temporal fenestra.

4) The triangular-shaped maxilla with its top above the canine and anteriorly extended lachrymal in *Stenocybus* are similar to that of pelycosaur sphenacodontids, but different from triangular-shaped maxilla with top above the posterior portion and short lachrymal as in other anteosaurids.

5) The depression receiving lower jaw adductor appears on dorsal surface of postfrontal in *Stenocybus*, rather than on frontal as in *Australosyodon*.

图版说明(Explanations of plates)

图版 I　(Plate I)

利齿狭头兽 *Stenocybus acidentatus* gen. et sp. nov. (IGCAGS V 361)　× 2 /3

上：头骨左侧(立体)视；　下：头骨右侧(立体)视

Upper: Steropair of skull in left view; Lower: Steropair of skull in right view

图版 II　(Plate II)

利齿狭头兽 *Stenocybus acidentatus* gen. et sp. nov. (IVPP V12008)　× 14 / 10

上：右上颌、下颌外侧视；　下：右上颌、下颌内侧视

Upper: Right upper and lower jaws in lateral view; Lower: Right upper and lower jaws in internal view

